



Department of Defense Legacy Resource Management Program

PROJECT 04-106

***H. L. HUNLEY* PROJECT:
Conservation Achievements
2004**

Paul Mardikian, Senior Conservator

February, 2005

THIS REPORT IS UNCLASSIFIED AND MAY BE RELEASED TO THE PUBLIC



H.L. Hunley Project Conservation Achievements 2004



Pencil HL-1097, before and after freeze drying stabilization

*Submitted by:
Paul Mardikian, Senior Conservator*



Artifacts Conservation

Preventive conservation of Hunley submarine and newly excavated artifacts (impressed current, chilled water, chemicals) while allowing the conservation effort and research to continue in the lab and public viewing of the sub at any time.

Continued conservation of the most fragile Hunley artifacts and developed a long-term conservation schedule for their treatment in partnership with the archaeologists.

Completed reconstruction of the 8 crewmember's crania after brain autopsies prior to reburial.



Completed bone removal from the most fragile and degraded shoes prior to reburial.

Completed cleaning and freeze-drying stabilization of felt slouch hat HL-1594 (awaiting final mounting for display by a textile conservator in 2005)

Completed cleaning and freeze-drying stabilization of all 16 leather shoes and associated samples (shoes awaiting final mounting for display by a leather conservator in 2005).



Completed cleaning and freeze-drying stabilization of pencils HL-1693, HL-1097, HL-2016.

Completed cleaning, stabilization and gluing of clay pipe HL-1471.

Completed cleaning and started conservation of the compass box HL-2281. Also disassembled gimble HL-2307 from compass box and placed in treatment solution.

Completed cleaning and freeze-drying stabilization of leather wallet (HL-1285).



Cleaned and prepared for freeze-drying composite (painted wood, leather, rubber, iron, copper) bellows HL-899, Dixon's seat HL-1964 and associated plank HL-1973.



Molding of pipe HL-1367 for facial reconstruction.

Started conservation of the following fragile organic or composite artifacts listed below:

HL- 962, HL- 1090, HL- 1206, HL- 1362, HL- 1471, HL- 1580, HL- 1584, HL- 1798, HL- 1865, HL- 2137, HL- 2311, HL- 2346, HL- 2363, HL- 2428, HL- 2784, HL- 3043, HL- 3197, HL- 3199, HL- 3225, HL- 3226, HL- 3282, HL- 3283, HL- 3293, HL- 3294, HL- 3302, HL- 3324, HL- 3353, HL- 3354, HL- 3358.

Work on the submarine

Completed material's assessment and metal analysis for Conservation Plan.

Assessment of submarine's corrosion status after excavation of the 74 iron ballast blocks.

Started pre-treatment of all iron ballast blocks removed from the submarine central compartment and ballast areas.

In situ conservation and removal of fragile artifacts such as the wooden shelf in grid 1 (HL-2280) and mercury depth gauge, as well as other features (protection, support, removal, molding and/or in situ protection).

Assisted the archaeologists with molding and casting of macrofaunal features in the submarine.

Removal and re-installation of cathodic protection on sub for Pacific Survey scanning, as well as for National Geographic piece prior to reburial.



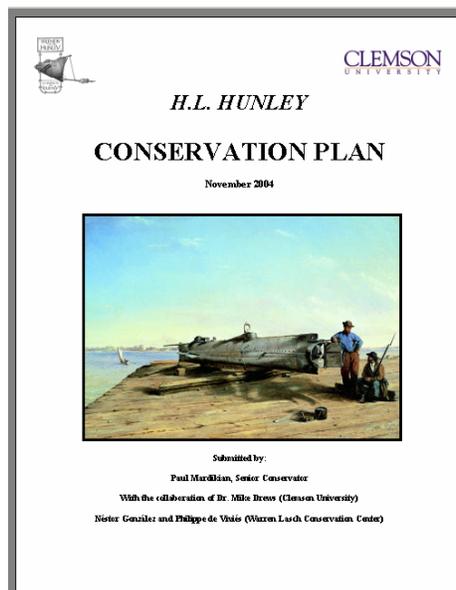
Hunley Structural and Material Analyses

Performed 116 x-rays on the submarine and related materials out of the 864 taken since the beginning of the Project.

Continued chloride extraction studies on Hunley samples using various techniques (see Conservation Plan)

Completed over 30 analytical studies of Hunley samples critical to the conservation process through the Clemson University analytical lab using SEM/EDX and FTIR techniques (paint analysis on binoculars; bellows analysis; corrosion products on shoes; FTIR analysis on leather shoes, organic compounds, additional analysis of Dixon's silver chain; etc).

Completed Hunley Conservation Plan for Naval Historical Center and sent out for peer review.



Completed preliminary metal sampling and analysis for Conservation Plan in collaboration with the Metallurgy Division, National Institute of Standards and Technology.



Passed lab inspections by North Charleston Sewer District and South Carolina Department of Health and Environmental Control for the use of electromagnetic radiation.

Met with the Head of the Science Department, M. Eicher, at the Academic Magnet High regarding experiments of corrosion under modified atmospheres.

Vocational training provided

Coordinated internships and work plan for two conservation interns (Frederique Nicot and Susanne Grieve) and two engineering students from Clemson University (Amanda Wagner and Kelly Grobin).

Lab hosted students from two of the advanced chemistry classes at Charleston County Magnet.

Grants/PR/Media/Donations

Registered the Friends of the Hunley with the National Science Foundation and submitted a proposal entitled, "Acquisition of an integrated FTIR/Raman and Micro-XRF Instrument Cluster-Friends of the Hunley Clemson University Consortium," to the National Science Foundation's Major Research Instrumental Program.

Submitted grant to Save America's Treasures for 2004.



Assisted on the Burroughs and Chaplin Hunley exhibit with technical data and helped with artifacts duplication.

A number of interviews and artifact presentations were conducted with National Geographic, German TV crew, local and national papers, such as Newsday and Invention and Technology.

Secured donation of new generation digital x-ray machine, Fuji AC3, to replace older AC1 machine.

Secured various equipment donations from Thermo Orion, Naco, Thompson Dental.

Other Projects

Continued work on Alabama cannons WL-358 & 345 for the Naval Historical Center.

Completed conservation work on Alabama bronze bell, stand and associated fabric WL-382, 383 & S#110.

Completed conservation of Alabama bronze artifacts (2 pulleys; 1 bolt) WL-317, WL-391, WL-349.

Continued work on Savannah torpedo for Army Corps of Engineers.

Assisted FOH with expertise and storage of Maritime Collection for Hunley Commission.

Assisted NHC with report on *Monitor* to Chief of Navy Staff.

Completed report on, and returned all, Hampton Roads artifacts after treatment (March 2004).

Provided additional data to Legacy Program per NHC.

Prepared lab and artifacts for hurricane season.



Professional Papers Published in 2004

Drews, M. J., de Viviés, P., Néstor G. González, N., and Mardikian, P., 2004 *A study of the analysis and removal of chloride in samples from the Hunley*. Metal 2004, Proceedings of the International Conference on Metals Conservation Canberra, Australia 4-8 October 2004. Published by National Museum of Australia, Canberra. J. Ashton, D. Hallam, (eds.). p.247-260.

González, N. G., de Vivies, P., Drews, M. J., and Mardikian, P. (2004) *Hunting Free and Bound Chloride in the Wrought Iron Rivets from the American Civil War Submarine H. L. Hunley*. Journal of the American Institute for Conservation 43, p.161-174.

Mardikian, P. (2004), *Conservation and Management Strategies Applied to Post-Recovery Analysis of the American Civil War Submarine H.L. Hunley (1864)*. The International Journal of Nautical Archaeology (2004) 33.1, p.137-148.

Meier, C.K. and Mardikian, P. (2004), *When Corrosion Science Meets an Icon of Maritime History*. NACE 2004 Conference, 28 March-1 April, New Orleans.

Professional Papers Presented in 2004

Mardikian, P., Baatz, P.E., de Vivies, P., Drews, M.J., Grieve, S., Nicot, F. (2005) *An Initial Investigation into the Effects of Ammonium Citrate on Waterlogged Leather from the H.L. Hunley Submarine (1864)*. Proceedings of the 9th ICOM-CC Group on Wet Organic Archaeological Materials Conference, Copenhagen (to be published 2005).

Peacock, E. (2005), *Investigation of conservation methods for textile recovered from H.L. Hunley submarine (1864)*. Proceedings of the 9th ICOM-CC Group on Wet Organic Archaeological Materials Conference, Copenhagen (to be published 2005).